

JAPANESE

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CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE INVENTION TECHNICAL PROBLEM MEANS EXAMPLE

[Translation done.]

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**DETAILED DESCRIPTION**

[Detailed Description of the Invention]

[0001]

[Field of the Invention]

About liquid lubricant, a lubricating oil composition, and bearing oil, it has the high flash point and especially this invention does not evaporate easily, though it is hypoviscosity, and it relates to liquid lubricant, the lubricant composition, and bearing oil which are excellent in heat resistance.

[0002]

[Description of the Prior Art]

The spindle motor used for an electric appliance especially CD, DVD, HDD, a polygon scanner, etc. is accelerated every year.

Now, a not less than 10000-rpm high velocity revolution is required increasingly.

Although anti-friction bearing represented by the ball bearing has been conventionally used for these spindle motors, noncontact dynamic pressure fluid bearing and the oil impregnated sintered bearing of low cost are increasingly used from performance and a cost aspect. The performance at the time of the high velocity revolution of these dynamic pressure fluid bearing and an oil impregnated sintered bearing (mainly running torque) becomes settled with the viscosity of the lubricant used in many cases, and the running torque at the time of a high velocity revolution tends to become low, so that it is hypoviscosity. On the other hand, once these lubricant is enclosed with a bearing mechanism, in order to have to maintain whole life lubricity in the state where there is no supply, the evaporation loss of lubricant and a decomposition loss must be avoided as much as possible.

It is difficult for an evaporation loss to also increase in the hydrocarbon-group oil represented by usual mineral oil, if it hypoviscosity-izes (low molecular weight), and to be compatible in hypoviscosity-izing and low evaporation-ization. Aiming at this coexistence, the art using ester which is a polar compound is indicated by base oil (JP,11-172267,A, JP,2001-240885,A, JP,2002-146374,A, etc.).

[0003]

However, if a polar substance like ester is used, modification and the fault of making it discolor will generate components, such as covering material, such as various resin materials, for example, CD, and a DVD disk, and a motor frame. For CD and DVD which record especially with a lightwave signal, coated resin must avoid blooming cloudy optically or changing as much as possible.

Since it is such, ester system oils outstanding as the characteristic also have the environment which cannot carry out real use. On the other hand, evaporativity is lower than the former to mineral oil to the motor instrument which uses many CDs, DVDs, and resin materials, and the lubricant which used as base oil Polly alpha olefin which is excellent in heat resistance has been used for it.

However, in order to correspond to improvement in the speed of a motor, hypoviscosity-ization of base oil accelerates and that whose kinetic viscosity at 40 \*\* is a 10-mm<sup>2</sup>/s grade is increasingly called for at

the present in recent years. The Polly alpha olefin marketed as base oil is oligomer of 1-decene, and viscosity is decided by the degree of polymerization. Kinetic viscosity [ in / in the Polly alpha olefin of a dimer with the lowest degree of polymerization / 40 \*\* ] is about 5mm<sup>2</sup>/s. Kinetic viscosity [ in / in the Polly alpha olefin of the trimer on it / 40 \*\* ] is about 17mm<sup>2</sup>/s. Therefore, if the kinetic viscosity at 40 \*\* tends to prepare the fluid lubrication agent which is 10mm<sup>2</sup>/s, it will become the blend with 5-mm<sup>2</sup>/s and 17-mm<sup>2</sup>/s inevitably. In this case, although target kinetic viscosity is attained, since the Polly alpha olefin of a dimer evaporated easily, there was a problem that the amount of losses of lubricant increased as compared with mineral oil of the viscosity.

[0004]

[Problem(s) to be Solved by the Invention]

This invention was made in order to solve aforementioned SUBJECT, though it is hypoviscosity, it has the high flash point and it does not evaporate easily, and an object of this invention is to provide liquid lubricant, the lubricant composition and oil impregnated sintered bearing oil, or fluid bearing oil which is excellent in heat resistance.

[0005]

[Means for Solving the Problem]

In order that this invention persons may attain said purpose, as a result of repeating research wholeheartedly, a raw material of the Polly alpha olefin not only in 1-decene (C(carbon number) 10). For example, it was referred to as C12 (1-dodecen) or C14 (1-tetra decene), and medium molecular weight and a middle viscosity fluid of lubricant of a commercial item were realized by polymerizing these. By this, excel mineral oil in evaporativity and heat resistance, and can provide liquid lubricant of hypoviscosity with few evaporation losses than a blend prepared solution object of a commercial item (1-decene oligomer), and this lubricant is further used as base oil. By blending various additive agents, it finds out that an oil impregnated sintered bearing oil or a fluid bearing oil using a lubricant composition and it which are excellent in hypoviscosity, low evaporativity, heat resistance, and lubricity can be provided, and this invention is completed.

[0006]

Namely, this invention,

Liquid lubricant whose pour point below 4.9-mm<sup>2</sup>/s and the flash point are not less than 180 \*\*, it consists of hydrocarbon of the carbon numbers 21-29, and kinetic viscosity in 6-16mm<sup>2</sup>/s and 100 \*\* is less than -15 \*\* in kinetic viscosity in 40 \*\*,

Consist of hydrocarbon of the carbon numbers 21-29, and kinetic viscosity in 40 \*\* (A) 6-16mm<sup>2</sup>/s, Kinetic viscosity in 100 \*\* to liquid lubricant whose pour point 4.9 or less and the flash point are not less than 180 \*\*, and is less than -15 \*\*. (B) In a lubricant composition and a row which blend at least a kind of additive agent chosen from an antioxidant, a friction modifier, a dispersing agent, a rust-proofer, a metal deactivator, a defoaming agent, a viscosity index improver, and a thickening agent An oil impregnated sintered bearing oil or a fluid bearing oil which consists of said liquid lubricant or said lubricant composition is provided.

[0007]

[Embodiment of the Invention]

The flash point is not less than 180 \*\*, liquid lubricant of this invention consists of hydrocarbon of the carbon numbers 21-29, and, in the kinetic viscosity in 40 \*\*, the kinetic viscosity in 6-16mm<sup>2</sup>/s and 100 \*\* is [ the pour point of below 4.9-mm<sup>2</sup>/s ] less than -15 \*\*.

It is desirable in it being the oligomer more than at least one kind of dimer chosen from 1-alkenes of the carbon numbers 4-24 as hydrocarbon of said carbon numbers 21-29 in liquid lubricant of this invention, and it is desirable especially when chosen out of 1-alkenes of the carbon numbers 12-14.

As 1-alkenes, for example 1-butene, 1-pentene, 1-hexene, 1-heptene, 1-octene, 1-nonene, 1-decene, 1-dodecen, 1-tetra decene, 1-hexa decene, 1-heptadecene, They are mentioned by 1-octadecene, 1-nonadecene, 1-cicosene, 1-strange cicosene, 1-docosene, 1-tricosene, 1-tetracosene, 1-pentacosene, 1-hexacosene, 1-heptacosene, 1-octacosene, 1-nonacosene, etc., and also in these, 1-dodecen and 1-tetra decene are especially preferred.

[0008]

The kinetic viscosity in 40 \*\* is below 4.9-mm<sup>2</sup>/s, and liquid lubricant of this invention has [ the kinetic viscosity in 6-16mm<sup>2</sup>/s and 100 \*\* ] it in the kinetic viscosity in 40 \*\* being [ the kinetic viscosity in 10-14mm<sup>2</sup>/s and 100 \*\* ] below 4-mm<sup>2</sup>/s. [ preferred ] It is because liquid lubricant of this invention aims at considering it as hypoviscosity.

Liquid lubricant of this invention is preferred in the flash point being not less than 180 \*\*, and it being not less than 200 \*\*. The flash point is because it is inferior to evaporativity or heat resistance in it being less than 180 \*\*.

The pour point is less than -15 \*\*, and liquid lubricant of this invention is preferred in it being -35 \*\* or less. If the pour point exceeds -15 \*\*, the viscous resistance at the time of low temperature will have an

adverse effect on increase, and the startability of a motor and operation.

80 \*\* under a thin film and the amount of evaporation of 96 hours after are preferred in it being below 12 mass %, and that of liquid lubricant of this invention are still more preferred in it being below 4 mass %.

[0009]

The lubricant composition of this invention blends with the (A) aforementioned liquid lubricant at least a kind of additive agent chosen from the (B) antioxidant, a friction modifier, a dispersing agent, a rust-proofer, a metal deactivator, a defoaming agent, a viscosity index improver, and a thickening agent.

[0010]

(A) The ingredient is the same as that of liquid lubricant of this invention mentioned above.

(B) As an antioxidant of an ingredient, an amine system antioxidant, a phenolic antioxidant, a sulfur-systems compound, etc. are mentioned.

As an amine system antioxidant, for example Monoctyldiphenylamine, Monoalkyl diphenylamine series, such as monononyldiphenylamine, 4,4'-dibutyldiphenylamine, 4, and 4'-dipentylidiphenylamine, 4,4'-dihexyldiphenylamine, 4,4'-diheptyl diphenylamine, Dialkyl diphenylamine systems, such as 4,4'-dioctyldiphenylamine, 4, and 4'-dinonylphenylamine, Tetrabutyl diphenylamine, tetrahexyldiphenylamine, Poly alkyl diphenylamine series, such as tetraoctyl diphenylamine and tetranonyldiphenylamine, alpha-naphthylamine, phenyl-alpha-naphthylamine, butylphenyl alpha-naphthylamine, Pentylphenyl-alpha-naphthylamine, hexylphenyl-alpha-naphthylamine, Naphthylamine systems, such as heptylphenyl-alpha-naphthylamine, octylphenyl-alpha-naphthylamine, and nonylphenyl alpha-naphthylamine, can be mentioned, and the thing of a dialkyl diphenylamine system is especially preferred. The above-mentioned amine system antioxidant may be used combining a kind or two sorts or more.

[0011]

As a phenolic antioxidant, for example 2,6-di-tert-butyl-4-methyl phenol, Mono- phenol systems, such as 2,6-di-tert-butyl-4-ethylphenol 2,6-di-tert-butyl-p-cresol, Diphenol systems, such as 4,4'-methylenebis (2,6-di-tert-butylphenol) and 2,2'-methylenebis (4-ethyl-6-tert-butylphenol), can be mentioned. The above-mentioned phenolic antioxidant may be used combining a kind or two sorts or more.

As a sulfur-systems compound, phenothiazin, pentaerythritol tetrakis (3-laurylthio propionate), A bis (3,5-tert-butyl-4-hydroxybenzyl)sulfide, Thiodiethylenbis(3)-(3,5-di-tert-butyl-4-hydroxyphenyl) propionate, 2,6-di-tert-butyl-4-(4,6-bis(octylthio)-1,3,5-triazine 2-methylamino) phenol, etc. are mentioned.

The desirable loadings of these antioxidants are the range of 0.01 - 10 mass % on a constituent whole-quantity standard, and especially its range of 0.03 - 5 mass % is preferred.

[0012]

As an oily agent of an ingredient, (B) Aliphatic series saturation and unsaturation monocarboxylic acid, such as stearic acid and oleic acid, Hydroxyfatty acid, such as polymerized fatty acid, such as dimer acid and hydrogenation dimer acid, ricinoleic acid, and 12-hydroxystearic acid, Aliphatic series saturation, unsaturation monocarboxylic acid amide, etc., such as aliphatic series saturation, such as aliphatic series saturation, such as lauryl alcohol and oleyl alcohol, and unsaturation monoalcohol, stearylamine, and oleylamine, and unsaturation monoamine, lauric acid amide, and oleic amide, are mentioned.

The desirable loadings of these oiliness agent are the range of 0.01 - 10 mass % on a constituent whole-quantity standard, and especially its range of 0.1 - 5 mass % is preferred.

[0013]

(B) The friction modifier of an ingredient can use what is generally used as an oily agent or an extreme pressure agent, and the amine salt and the sulfur-systems extreme pressure agent of phosphoric ester and phosphoric ester are mentioned especially.

As phosphoric ester, phosphoric ester, the alkyl acid phosphate, the phosphite, and the acid phosphite which are expressed with following general formula (I) - (V) are included.

[0014]

[Formula 1]



[0015]

In the above-mentioned general formula (I) - (V),  $R^1 - R^3$  show an alkyl group, an alkenyl group, an alkyl aryl group, and an arylated alkyl group of the carbon numbers 4-30, may be the same, or may differ. [ of  $R^1 - R^3$  ]

As phosphoric ester, trialkyl phosphate, trialkyl phosphate, Trialkyl aryl phosphate, trialkyl alkyl phosphate, There are trialkenyl phosphate etc. and For example, triphenyl phosphate, Tricresyl phosphate, benzyldiphenyl phosphate, ethyldiphenyl phosphate, Tributyl phosphate, ethyldibutyl phosphate, cresyl diphenyl phosphate, Dicresyl phenyl phosphate, ethylphenyldiphenyl phosphate, Diethylphenylphenyl phosphate, propylphenyldiphenyl phosphate, Dipropylphenylphenyl phosphate, triethylphenyl phosphate, TORIPURO pill phenyl phosphate, buthylphenyl diphenyl phosphate, Dibutylphenylphenyl phosphate, tributylphenyl phosphate, Trihexyl phosphate, Tori (2-ethylhexyl) phosphate, Tridecyl phosphate, trilauryl phosphate, TORIMIRISUCHIRU phosphate, tripalmityl phosphate, Triste allyl phosphate, trio rail phosphate, etc. can be mentioned.

[0016]

As alkyl acid phosphate, for example 2-ethylhexyl acid phosphate, Ethyl acid phosphate, butyl acid phosphate, oleyl acid phosphate, Tetracosyl acid phosphate, isodecylacidphosphate, lauryl acid phosphate, tridecyl acid phosphate, stearyl acid phosphate, isostearylacidphosphate, etc. can be mentioned.

[0017]

As phosphite, for example Triethyl phosphite, tributyl phosphite, Triphenyl phosphite, tricresyl phosphite, Tori (nonylphenyl) phosphite, Tori (2-ethylhexyl) phosphite, triauryl phosphite, triauryl phosphite, tri-iso-octyl phosphite, diphenyl isodecyl phosphite, tristearylphosphite, trioleyl phosphite, etc. can be mentioned.

[0018]

As acid phosphite, dibutyl hydrogen phosphite, dilauryl hydrogen phosphite, dioleoyl hydrogen phosphite, distearyl hydrogen phosphite, diphenyl hydrogen phosphite, etc. can be mentioned, for example. In the above phosphoric ester, tricresyl phosphate and triphenyl phosphate are preferred.

[0019]

As amines which form these and amine salt, it is general formula (VI), for example.



( $R^4$  shows an alkyl group of the carbon numbers 3-30 or an alkenyl group, an aryl group of the carbon numbers 6-30, an arylated alkyl group, or a hydroxyalkyl group of the carbon numbers 2-30 among a formula, and n shows 1, 2, or 3.) When there is two or more  $R^4$ , two or more  $R^4$  may be the same, or may differ.

It comes out and mono- substitution amine, II substitution amine, or the Tori substitution amine expressed is mentioned. Alkyl groups or alkenyl groups of the carbon numbers 3-30 of the  $R^4$  in the above-mentioned general formula (VI) may be straight chain shape and branched state and annular any.

[0020]

As an example of mono- substitution amine, a butylamine, pentylamine, hexylamine, Can mention cyclohexylamine, octylamine, lauryl amine, stearylamine, oleylamine, benzylamine, etc., and as an example of II substitution amine, Dibutyl amine, dipentylamine, dihexyl amine, dicyclohexylamine, Dioctyl amine, dilauryl amine, distearyl amine, dioleoyl amine, Dibenzylamine, stearylmonoethanolamine, decylmonoethanolamine, Hexylmono- propanolamine, benzylmonoethanolamine, Can mention phenylmonoethanolamine, tolyl monopropanol, etc. and as an example of Tori substitution amine, Tributylamine, tripentylamine, trihexyl amine, tri-cyclo hexylamine, Tri-octylamine, tri-laurylamine, the Triste allylamine, Triolet ylamine, tribenzylamine, dioleoyl monoethanolamine, dilauryl mono- propanolamine, dioctylmonoethanolamine, dihexylmono- propanolamine, dibutylmono- propanolamine, Oleyldiethanolamine, stearyl dipropanolamine, Lauryl diethanolamine, octyl dipropanolamine, Butyldiethanolamine, benzyldiethanolamine, phenyldiethanolamine, tolyl dipropanolamine, xylyldiethanolamine, triethanolamine, tripropanolamine, etc. can be mentioned.

[0021]

As a sulfur-systems extreme pressure agent, to have a sulfur atom in intramolecular and what is necessary is just the dissolution or a thing which distributes uniformly and can demonstrate an extreme pressure property and the outstanding friction characteristic at lubricant base oil. As such a thing, for example Sulfurized oil fat, sulfuration fatty acid, ester sulfide, Olefin sulfide, dihydrocull BIRUPORISARUFAIDO, a thiadiazole compound, Thiophosphoric ester (thio phosphite, thio phosphate), an alkylthio carbamoyl compound, a thiocarbamate compound, a thio terpene compound, a dialkyl thiodipropionate compound, etc. can be mentioned. Although it is obtained here by sulfurized oil fat making fats and oils (lard oil, whale oil, vegetable oil, fish oil, etc.) react to sulfur or a sulfur content compound and the sulfur content does not have restriction in particular, generally a thing of 5 - 30 mass % is preferred. As the example, sulfuration lard, sulfuration rape oil, sulfuration castor oil, sulfuration soybean oil, sulfuration rice-bran oil, etc. can be mentioned. Oleic acid sulfide can be mentioned as an example of sulfuration fatty acid, and methyl oleate sulfide, rice bran fatty acid octyl, sulfide can be mentioned as an example of ester sulfide.

[0022]

Following general formula (VII) as olefin sulfide for example

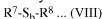


( $R^5$  shows an alkenyl group of the carbon numbers 2-15 among a formula,  $R^6$  shows an alkyl group or an alkenyl group of the carbon numbers 2-15, and a shows an integer of 1-8.)

It can come out and a compound etc. which are expressed can be mentioned. This compound is obtained by making an olefin of the carbon numbers 2-15 or its 2 - a tetramer react to sulphidizing agents, such as sulfur and a sulfur chloride, and propylene, isobutene, diisobutene, etc. are preferred as this olefin.

[0023]

As dihydrocull BIRUPORISARUFAIDO, it is following general formula (VIII).



the inside of a formula,  $R^7$ , and  $R^8$  -- respectively -- an alkyl group of the carbon numbers 1-20, or an annular alkyl group. An aryl group of the carbon numbers 6-20, an alkyl aryl group of the carbon

numbers 7-20, or an arylated alkyl group of the carbon numbers 7-20 is shown, they may be mutually the same, or it may differ, and b shows an integer of 1-8.

It is a compound come out of and expressed. Here, it is called an alkyl sulfide when R<sup>7</sup> and R<sup>8</sup> are alkyl groups.

[0024]

R<sup>7</sup> and R<sup>8</sup> in the above-mentioned general formula (VIII), A methyl group, an ethyl group, n-propyl group, an isopropyl group, n-butyl group, An isobutyl group, a sec-butyl group, a tert-butyl group, various pentyl groups, Various various hexyl group, various heptyl group, and octyl groups, various nonyl groups, various decyl groups, various dodecyl, a cyclohexyl group, a cyclooctyl group, a phenyl group, a naphthyl group, a tolyl group, a xyl group, benzyl, a phenethyl group, etc. can be mentioned.

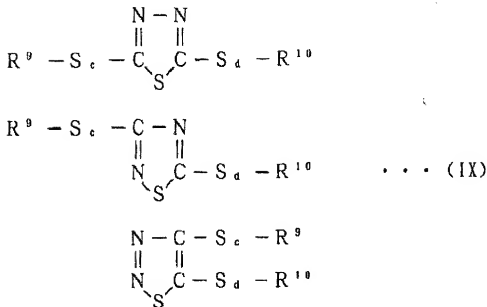
[0025]

As this dihydrocull BIRUPORISARUFAIDO, For example, dibenzyl polysulfide, various dinonyl polysulfide, Various didodecyl polysulfide, various dibutyl polysulfide, various dioctyl polysulfide, diphenyl polysulfide, dicyclohexyl polysulfide, etc. can be mentioned preferably.

[0026]

As a thiadiazole compound, it is following general formula (IX), for example.

[Formula 2]



[0027]

(R<sup>9</sup> and R<sup>10</sup> show the hydrocarbon group of a hydrogen atom and the carbon numbers 1-20 among a formula, respectively, and c and d show the integer of 0-8, respectively.)

It comes out and the 1,3,4-thiadiazole expressed, 1 and 2, 4-thiadiazole compound, 1 and 4, 5-thiadiazole, etc. are used preferably.

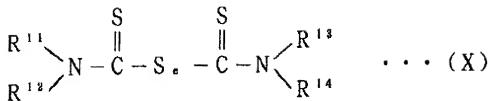
As this thiadiazole compound, for example 2,5-bis(n-hexyldithio)-1,3,4-thiadiazole, 2,5-bis(n-octyldithio)-1,3,4-thiadiazole, 2,5-bis(n-nonyldithio)-1,3,4-thiadiazole, 2,5-bis(1,1,3,3, -tetramethylbutyldithio)-1,3,4-thiadiazole, 3,5-bis(n-hexyldithio)-1, 2, 4-thiadiazole, 3,5-bis(n-octyldithio)-1, 2, 4-thiadiazole, 3,5-bis(n-nonyldithio)-1, 2, 4-thiadiazole, 3,5-bis(1,1,3,3, -tetramethylbutyldithio)-1, 2, 4-thiadiazole, 4,5-bis(n-hexyldithio)-1, 2, 3-thiadiazole, 4,5-bis(n-octyldithio)-1,2,3-thiadiazole, 4,5-bis(n-nonyldithio)-1,2,3-thiadiazole, 4,5-bis(1,1,3,3, -tetramethylbutyldithio)-1, 2, and 3-thiadiazole etc. can be mentioned preferably.

[0028]

As thiophosphoric ester, alkyl TORICHIO phosphite, aryl or alkyl arylthio phosphate, dilauryl dithiophosphate zinc, etc. are mentioned, and lauryl TORICHIO phosphite and triphenylthio phosphate are especially preferred.

As an alkylthio carbamoyl compound, it is following general formula (X), for example.

[Formula 3]



[0029]

(R<sup>11</sup> - R<sup>14</sup> show the alkyl group of the carbon numbers 1-20 among a formula, respectively, and e shows the integer of 1-8.)

As this alkylthio carbamoyl compound, For example, bis(dimethylthiocarbamoyl)monosulfide, bis(dibutylthiocarbamoyl)monosulfide, Bis(dimethylthiocarbamoyl)disulfide, bis(dibutylthiocarbamoyl)disulfide, bis(diamylthiocarbamoyl)disulfide, bis(dioctylthiocarbamoyl)disulfide, etc. can be mentioned preferably.

[0030]

As a thiocarbamate compound, dialkyl zinc dithiocarbamate, for example as a thio terpene compound, For example, the reactant of phosphorus pentasulfide and pinene can be mentioned for dialkylthiodipropionate, distearylthiodipropionate, etc. as a dialkylthiodipropionate compound, for example. In these, the thiadiazole compound from points, such as an extreme pressure property, the friction characteristic, and thermal oxidation stability, and benzyl sulfide are preferred.

[0031]

Desirable loadings of these friction modifiers are the range of 0.01 - 10 mass % on a constituent whole-quantity standard, and especially its range of 0.05 - 5 mass % is preferred. When loadings are less than 0.01 mass %, even if an improved effect of the friction characteristic by a synergistic effect with other ingredients may be insufficient and loadings exceed 10 mass %, improvement in an effect equivalent to loadings may not be found.

[0032]

(B) As a dispersing agent of an ingredient, metal sulfonate, metal phenate, metallosalicylate, metal phosphonate, succinimid, etc. can be mentioned, for example.

Desirable loadings of these dispersing agents are the range of 0.01 - 10 mass % on a constituent whole-quantity standard, and especially its range of 0.5 - 5 mass % is preferred.

[0033]

As a rust-proofer of an ingredient, for example (B) Dodecenyl succinic acid half ester, Alkyl or alkenyl succinic acid derivatives, such as an octadecenyl succinic acid anhydride and dodecenyl succinic acid amide, Polyhydric alcohol partial ester, such as sorbitan monooleate, glycerin monooleate, and pentaerythritol monooleate, Ca-petroleum sulfonate, Ca-alkyl benzene sulfonate, Ba-alkyl benzene sulfonate, Mg-alkyl benzene sulfonate, It is usable in amines, such as metal sulfonate, such as Na-alkyl benzene sulfonate, Zn-alkyl benzene sulfonate, and Ca-alkyl naphthalene sulfonate, rosinamine, and N-oleyl ZARUKOSHIN, dialkyl phosphite amine salt, etc.

Desirable loadings of these rust-proofers are the range of 0.01 - 5 mass % on a constituent whole-quantity standard, and especially its range of 0.05 - 2 mass % is preferred.

[0034]

(B) As a metal deactivator of an ingredient, it is usable in a compound of a benzotriazol system, a thiadiazole system, and a gallate system, etc., for example.

Desirable loadings of these metal deactivators are 0.01 to 0.4 mass % on a constituent whole-quantity standard, and especially its range of 0.01 - 0.2 mass % is preferred.

(B) As a defoaming agent of an ingredient, liquid silicone is suitable, for example, it is usable in methyl silicone, fluorosilicone, and polyacrylate.

Desirable loadings of these defoaming agents are 0.0005 to 0.01 mass % on a constituent whole-quantity standard.

[0035]

(B) As a viscosity index improver of an ingredient, it is usable in olefine copolymers, such as poly alkyl methacrylate, poly alkyl styrene, polybutene, ethylene propylene rubber, a styrene diene copolymer, and a styrene maleic-anhydride-ester copolymer.

Desirable loadings of these viscosity index improvers are 0.1 to 15 mass % on a constituent whole-quantity standard, and especially its range of 0.5 - 7 mass % is preferred.

[0036]

(B) As a thickening agent of an ingredient, metal soap is preferred, for example, what is shown with 12-

hydronaliumstearic acid Li metal salt, 12-hydronaliumstearic acid Ca metal salt, 12-hydronaliumstearic acid Na metal salt, or a following general formula (1) is mentioned.

$(R-COO)_nM_x \dots (1)$

( $M_x$  is elements, such as Na, Mg, aluminum, K, Ca, Li, Ti, Mn, Fe, Co, nickel, Cu, and Zn, and R shows an alkyl group of the carbon numbers 4-30, an alkyl aryl group, an alkenyl group, and an arylated alkyl group.)  $n$  is an integer of 1-3.

(1) In a formula, that whose  $M_x$  is Mg, aluminum, or Zn is preferred.

Desirable loadings of these thickening agents are 0.01 to 10 mass % on a constituent whole-quantity standard, and especially its range of 0.5 - 5 mass % is preferred.

[0037]

A lubricant composition of this invention has preferred kinetic viscosity in 40 °C in it being 6-16mm<sup>2</sup>/s, is especially preferred in it being 8-14mm<sup>2</sup>/s, and still more preferred in it being 10-14mm<sup>2</sup>/s.

It is desirable in the flash point being not less than 200 °C, still more desirable in it being not less than 210 °C, desirable in the pour point being less than -35 °C, and still more desirable in it being -40 °C or less.

80 °C under a thin film and an amount of evaporation of 96 hours after are preferred in it being below 12 mass %, and it is still more desirable in it being below 4 mass %.

Since it has the high flash point, and the above liquid lubricant and lubricant composition of this invention do not evaporate easily and are excellent in heat resistance though it is hypoviscosity, they fit an oil impregnated sintered bearing oil or a fluid bearing oil used for a high speed motor etc.

[0038]

[Example]

Next, this invention is explained in more detail using working example.

The description of the base oil used by working example and a comparative example and the performance of the oil-retaining-bearing oil were measured as follows.

(1) Kinetic viscosity

It measured according to JIS K 2283.

(2) Total acid number

It measured according to the 5th paragraph of JIS K 2501.

(3) Flash point

It measured according to JIS K 2265.

(4) Pour point

It measured according to JIS K 2269.

(5) Aniline point

It measured according to JIS K 2256. It dissolves in resin, rubber, etc. and is easy to swell them, so that this value is low.

(6) Thin film residue examination (residual oil rate)

Using the container and a homothermal air bath which are shown in the lubricious oil heat stability test of JIS K 2540, the amount of samples was 1 g and 80 °C and the amount of residues of 96 hours were measured. It was expressed in units of percentage and it was considered as the residual oil rate.

The oils appearance of 96 hours after was observed, and the existence of insoluble sludge was checked to oil.

10 l / hr slushed air continuously during measurement.

(7) Load-carrying-capacity examination

Based on ASTM D 2783, it carried out on condition of the number of rotations of 1,800 rpm, and a room temperature. It asked for the load abrasion index (LWI) from maximum non-printing load (LNL) and weld load (WL). Load carrying capacity is so good that this value is large.

(8) Abrasion resistant test

Based on ASTM D 2783, it carried out on the load 392N, the number of rotations of 1,200 rpm, the oil temperature of 80 °C, and the conditions for test time 60 minutes. The diameter of an average abrasion was computed by having averaged the diameter of an abrasion of three 1/2-inch balls.

[0039]

Working example 1-2 and the comparative examples 1-4

As liquid lubricant, the thing of the kind shown in Table 1 was prepared, and the performance was evaluated. The result is shown in Table 1.

The commercial Polly alpha olefins of the inside of Table 1 and the comparative example 1 are a product made by Amoco, and a trade name. DURASYN162 and the commercial Polly alpha olefin of the comparative example 2 are a product made by Amoco, and a trade name. DURASYN164 was used.

[0040]

[Table 1]



表 1

	実施例1 ポリ- $\alpha$ -オレフィン (1-ドデセンの二 量体)	実施例2 ポリ- $\alpha$ -オレフィン (1-テトラデセン の二量体)	比較例1 市販ポリ- $\alpha$ -オレフィン (1-ドデセンの二量体)	比較例2 市販ポリ- $\alpha$ -オレフィン (1-デセンの三量体)	比較例3 市販ポリ- $\alpha$ -オレフィンの混合物 比較例1(40質量%)+比較例2 (60質量%)	比較例4 エステル ジオクチルセバケート
動粘度(40°C) (mm <sup>2</sup> /s)	928	129	5.1	16.9	10.42	11.54
動粘度(100°C) (mm <sup>2</sup> /s)	2488	322	1.8	3.9	2.793	3.22
引火点 (°C)	204 (COC法)	218 (COC法)	156 (PM法)	222 (COC法)	192 (COC法)	222 (COC法)
全炭素 mg KOH/g	0.03	0.01	0.01	0.01	0.01	0.02
流動点 (°C)	-45	-45	-50>	-50>	-50>	-50>
アニリン点 (°C)	108.3	115.7	90.6	123.1	115	20>
酸価試験(煤油率 (質量%))	89.8	98.98	42.05	99.56	72.36	100

\* As for the COC method and the PM method in the flash point in Table 1, based on JIS K 2265, especially the PM method is applied to the low thing of the flash point.

[Table 2]

表 2

	表-2	実施例3	実施例4	実施例5	実施例6	実施例7	実施例8	実施例9	比較例5
基油		98.99	97.99	97.99	98.94	97.94	97.49	96.99	57.49 40
酸化防止剤		1	1	1	1	1	1	1	
摩擦調整剤				1	0.05	0.05		1	1
分散剤							0.5	0.5	0.5
金属不溶性化剤 $(\text{mm}^2/\text{s})$		0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
組成物中の性質		12.6	13.1	13	12.6	13.2	13	13.1	10.54
動粘度(40℃)		3.221	3.225	3.225	3.222	3.225	3.224	3.226	2.783
引火点(COC法) $(^\circ\text{C})$		220	223	220	220	222	216	215	192
流動点 $(^\circ\text{C})$		-45	-45	-45	-45	-45	-45	-45	-50>
アミン含量(LWI)		115.3	115.6	114.8	115.1	115	114.7	114.5	112
耐高重性試験		142	176	381	288	365	408	402	288
耐摩耗性試験		0.68	0.54	0.42	0.46	0.43	0.53	0.4	0.49
濃縮残さ試験		99.25	99.06	99.08	99.06	99.01	99.05	99.03	72.25
外観		無スラッシュの有	無	無	無	無	無	無	無

\* The JI (mono-) methyl-acid-phosphate amine salt of the friction modifier in Table 2 is a mixture of mono-object:di-object =50:50 (mole ratio).

[0043]

[Effect of the Invention]

As explained to details above, it has the high flash point, and liquid lubricant and the lubricant composition of this invention do not evaporate easily, though it is hypoviscosity, and are excellent in heat resistance. For this reason, it is useful to the oil impregnated sintered bearing oil or fluid bearing oil used for a high speed motor etc.

[Translation done.]

